

A History of Space Shuttle Main Engine (SSME) Redline Limits Management

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Abstract

The Space Shuttle Main Engine (SSME) has several “redlines”, which are operational limits designated to preclude a catastrophic shutdown of the SSME. The Space Shuttle Orbiter utilizes a combination of hardware and software to enable or disable the automated redline shutdown capability. The Space Shuttle is launched with the automated SSME redline limits enabled, but there are many scenarios which may result in the manual disabling of the software by the onboard crew. The operational philosophy for manually enabling and disabling the redline limits software has evolved continuously throughout the history of the Space Shuttle Program, due to events such as SSME hardware changes and updates to Space Shuttle contingency abort software. In this paper, the evolution of SSME redline limits management will be fully reviewed, including the operational scenarios which call for manual intervention, and the events that triggered changes to the philosophy. Following this review, improvements to the management of redline limits for future spacecraft will be proposed.